CASE REPORT

Modified Valsalva manoeuvre to treat recurrent supraventricular tachycardia: description of the technique and its successful use in a patient with a previous near fatal complication of DC cardioversion

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SUMMARY

Patients with attacks of re-entrant supraventricular tachycardia (SVT) frequently present to the emergency department (ED). The Valsalva manoeuvre (VM) is the most effective and safe vagal manoeuvre and advocated as the first-line treatment in stable patients but has a relatively low cardioversion success rate. Improving its efficacy would reduce patients' exposure to the side effects and complications of second-line treatments and has other potential benefits. We describe a modification to the VM, which is currently being studied, and present the case of a 23-year-old patient who was successfully treated with this modified VM after a previous near-fatal complication of direct current (DC) cardioversion.

BACKGROUND

This is the first description, to our knowledge, of this particular modification to the Valsalva manoeuvre (VM) and how it was successfully used in a patient whose re-entrant supraventricular tachycardia (SVT) was thought to be refractory to such vagal techniques. It suggests that employing a more effective VM might reduce the number of patients who go on to require unpleasant, more invasive and potentially dangerous treatments. It also specifically describes the modification technique that is currently undergoing national portfolio randomised controlled trial evaluation.

CASE PRESENTATION

A 23-year-old man presented to the ED with SVT. His heart rate was 106 beats per minute, blood pressure 120/55 mmHg and he was alert but uncomfortable and reporting palpitations. He weighed 140 kg and was unstarved.

The patient was well known to the hospital; he had presented with recurrent SVT of slow rate, with attacks requiring hospital attendance, on more than 30 occasions over 13 years. Previously, standard vagal manoeuvres had always been unsuccessful and intravenous adenosine avoided due to intolerable side effects and previous ineffectiveness. Intravenous verapamil had also been unsuccessful. Intravenous flecainide had occasionally worked but his SVT continued to recur despite regular oral flecainide and bisoprolol.

He had undergone appropriate specialist investigation and review previously but had declined (with capacity) several offers of radio-frequency ablation therapy prior to this attendance. Latterly, the most effective emergency treatment had been direct current (DC) cardioversion. He had undergone this on 12 previous attendances and there was an agreed multispecialty plan for its use.

At his previous attendance, once more a failed standard VM had been followed by attempted DC cardioversion. However, during the procedure, the synchronisation mode of the defibrillator had either malfunctioned or been inadvertently reset. The consequent delivery of an unsynchronised shock resulted in ventricular fibrillation. Twelve minutes of advanced life support and four attempts at defibrillation were required before return of spontaneous circulation. He subsequently spent 24 h in intensive care and 3 days in hospital before being discharged neurologically intact.

INVESTIGATIONS

His initial ECG showed a re-entrant SVT, typical of previous attacks, and like these had an unusually slow rate, which was thought to be due to his bisoprolol and flecainide therapy. Copies of his precardioversion ECG (figure 1) and postcardioversion ECG (figure 2) are shown.

TREATMENT

Given this previous complication, unstarved state and understandable anxiety about DC cardioversion, it was decided to attempt a VM using a modification for which a research proposal was being developed locally.

Modified VM Technique: This requires the patient to perform a standardised Valsalva strain (to 40 mm Hg, verified on a manometer) in a semirecumbent position for 15 s before being laid flat with legs passively lifted to 45° by staff immediately at the end of the strain to maximise venous return in the relaxation phase for a further 15 s.

This was immediately successful with return of sinus rhythm during the leg lift and the patient was discharged with advice on how to perform this modified VM himself using a 10 mL syringe (shown to equate to 40 mm Hg pressure when

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Figure 1 Pre-Valsalva ECG showing slow rate supraventricular tachycardia.

blown to just effect plunger movement¹) with passive leg lift by a family member.

OUTCOME AND FOLLOW-UP

This modified VM has been added to the patient's management plan. Over the 2 years since he was first successfully treated, the patient has only attended ED 4 further times with an SVT. He has been successfully treated with the modified VM on three of these occasions (the other being with intravenous flecainide

without prior use of any VM). He reports he has successfully used this manoeuvre on numerous occasions at home as advised, negating the need to attend ED.

DISCUSSION

Vagal manoeuvres such as the VM are recommended first-line emergency treatments for SVT but often lack efficacy. Evidence for the optimum VM technique is limited² though

Figure 2 Post-modified Valsalva ECG confirming sinus rhythm.

electrophysiology laboratory studies suggest a strain of 40 mm Hg for 15 s leads to the greatest reflex bradycardia in healthy volunteers.³

Modifications to the VM have been described^{4–6} and may affect its efficacy in the ED setting.⁷ Venous return is increased by leg elevation due to the effects of gravity on blood in the lower limb veins and it is hypothesised that a passive leg lift during phase 3 of the Valsalva, performed immediately at the end of the strain period (phases 1 and 2), may lead to an exaggerated overshoot in blood pressure in phase 4. This may result in greater vagal stimulation to effect bradycardia and increase the chance of cardioversion. A passive leg lift is used as the patient straining to actively lift legs may increase sympathetic tone during phase 3 and may therefore be counterproductive.

There is some evidence that a passive leg lift performed during a supine Valsalva leads to greater vagal tone in normal volunteers compared to a sitting or semirecumbent Valsalva.⁸ Although in this study greater vagal tone was achieved with a plain supine Valsalva, the effect of passive leg lift and supine positioning at the end of a semirecumbent strain phase (1 and 2), as used in our case, is unknown. A Valsalva strain performed semirecumbent may initially exaggerate reduced venous return and hence increase sympathetic stimulation during phases 1 and 2; this is suddenly reversed with the drop in intrathoracic pressure and increased venous return afforded by the supine position and passive leg lift in phase 3 used in the modified manoeuvre we describe.

This is the first report, to our knowledge, of the particular manoeuvre used in our patient to treat SVT and has not been previously studied in normal volunteers or patients. Our region is currently conducting a randomised trial of this modification

compared to a standard VM in patients presenting to the ED with SVT.^{9 10}

Second-line treatments for SVT are efficacious but not without side effects and, as our case graphically illustrated, potentially serious, albeit rare complications. Although intravenous adenosine is highly effective, safe and favoured by ED physicians,¹¹ many patients find it very unpleasant and frightening.¹² A more successful VM will reduce the need for patients to go on to receive these treatments and to have a more effective home treatment saving them, and ED staff, time.

We have described a case where the use of a modified VM successfully converted a patient's SVT, which had been thought to be refractory to vagal manoeuvres. The patient had previously suffered a severe complication of second line treatment, which may have been avoided with the use of this simple physical treatment that is currently being further evaluated in a controlled trial.

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Competing interests None.

Patient consent Obtained.

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Learning points

- Vagal manoeuvres remain the first-line treatment for patients presenting with stable supraventricular tachycardia (SVT).
- The Valsalva manoeuvre (VM) is the safest, most effective vagal technique but is often ineffective in standard practice.
- Other treatments for SVT are not entirely without risk or discomfort.
- A postural modification to the VM might improve its efficacy and prevent the need for further emergency treatment.
- The modified VM technique described in this case report is now undergoing randomised controlled trial evaluation.